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(54) **RECEIVER.**

(57) A receiver enabling selective reception of radio waves from broadcasting stations, whose frequencies stored beforehand, the receiver having a first memory means for storing groups of broadcasting station frequencies, each group being for broadcasting stations in one of plural areas, a second memory means for storing an arbitrary broadcasting station frequency, and a means for selecting a desired broadcasting station frequency stored in the memory means. A desired broadcasting station frequency can be quickly selected by the selecting means even on travel or business trip.

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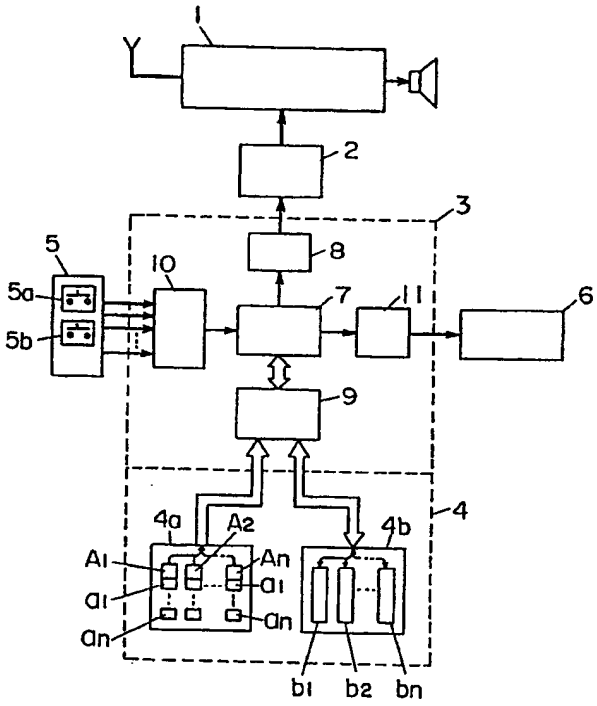
FIG. 1



TECHNICAL FIELD

The present invention relates to a receiver such as a PLL synthesizer receiver which can selectively receive the frequency of a stored radiobroadcasting station.

BACKGROUND ART

Conventionally, PLL synthesizer receivers are generally configurated as shown in Fig. 12. That is, with regard to a receiving circuit 21, a PLL circuit 22 for selecting the receiving frequency is provided, and the frequency dividing ratio of a programmable frequency divider of this PLL circuit 22 is controlled by a controlling means 23, and thereby receiving is performed at a desired receiving frequency. Numeral 24 designates an operating means for performing operating input to the means for performing operating input to the above-mentioned controlling means 23, numeral 25 designates a storing means for storing desired frequencies of radiobroadcasting stations, and numeral 26 designates a display unit of frequency and the like. Here, the above-mentioned operating means 24 comprises a band key for selecting a frequency band for selecting a receiving frequency of a station, a station select key for performing up/down of the frequency, and further a memory key for writing for preset memory, and read keys such as a scroll key for reading stored frequencies (or a select key of a required number of memories).

Then, a radiobroadcasting station of a desired receiving frequency is selected and listened to by the band key 24 and the station select key of the operating means 24, and the selected receiving frequency is written to the storing means 25 by the memory key to be set as a preset memory, and the preset receiving frequency is read by operating the read key, and thereby receiving can be made.

However, in the above-mentioned conventional receiver, the receiving frequencies of the desired radiobroadcasting stations are stored in advance in the storing means, and can be read at any time as required to be received promptly, but, for example, in the case where this receiver is used in another area on a private or business trip, the receiving frequencies of the radiobroadcasting stations which have been preset in advance cannot be used, and a troublesome receiving operation has to be made while searching the frequency of the radiobroadcasting station in that area. At this time, where the frequency of the radiobroadcasting station in that area is unknown, there is no means other than searching for the frequency while varying the frequency is sequence.

DISCLOSURE OF THE INVENTION

In the light of the conventional problem as described above, the present invention has been made for the purpose of providing a receiver which can promptly select the frequency of the radiobroadcasting station of an area even on a journey or business trip thereto, can be operated easily, and can write frequencies of arbitrary broadcasting station.

In order to solve the above-mentioned problem, the receiver of the present invention

(1) comprises a first storing means for storing frequencies of radiobroadcasting stations in each of a plurality of areas, a second storing means capable of storing frequencies of arbitrary radiobroadcasting stations, a selection operating means for selecting the frequency of the necessary radiobroadcasting station for the above-mentioned first storing means and second storing means, and a station selection controlling means for making it possible to receive the frequency of a radiobroadcasting station in the desired area which is stored as mentioned above in correspondence to a selection of this selection operating means.

(2) The above-mentioned selection operating means comprises a first selection operating means for selecting an area, and a second selection operating means for selecting the frequency of the necessary radiobroadcasting station in that area.

(3) The above-mentioned receiver comprises a display unit having an area name display part of a plurality of areas, a receiving frequency display part and/or a radiobroadcasting station name display part, whereby each part is configurated so as to be capable of selective display.

(4) The station selection controlling means is so configurated that area selection by the first selection operating means is made possible only in non-receiving state.

(5) The station selection controlling means is so configurated as to control in a manner that frequency selection by the station select switch is stopped when a selection by the first selection operating means selects an area of the first storing means, and an arbitrary selection of the receiving frequency by the station select switch is made possible when the second storing means is station-selected.

(6) A receiver which can selectively receive the receiving frequency of a radiobroadcasting station stored in advance by a predetermined operation, and comprises a first storing means for storing frequencies of radiobroadcasting stations in each of a plurality of areas, a tuning detecting means for detecting tuning above a certain level, an automatic search start operating means for

identifying the area of use, a second storing means which start sweep by a start signal of this automatic search start operating means, and stores an appropriate receiving frequency at each stop of sweep by an output of the above-mentioned tuning detecting means, and a station selection controlling means which compares the receiving frequency of this second storing means with the frequency stored in the above-mentioned storing means, selects the receiving area where the both frequencies agree with each other, and makes it possible to receive the frequency of the radiobroadcasting station in that area.

(7) In the above-mentioned Item (6), a selection operating means for selecting the frequency of a necessary radiobroadcasting station in the selected receiving area is installed.

(8) In the above-mentioned Item (6), a third storing means capable of storing frequencies of arbitrary radiobroadcasting stations and a selection operating means for selecting the frequencies in this third storing means are provided.

(9) In the above-mentioned Item (6), the tuning detecting means is provided with an intensity detecting circuit detecting that the intensity of a signal received by amplitude detection of an intermediate-frequency signal is above a certain level and a frequency detecting circuit detecting whether or not the value of the frequency of the above-mentioned intermediate-frequency signal is a predetermined value, thereby to perform a detection of the level of the received signal and a detection of agreement of frequencies.

(10) In the above-mentioned Item (6), a displaying means is provided which displays that automatic search for the receiving area is being made after sweep has been started by an automatic search start operating means or displays that the search has become impossible.

(11) A receiver can selectively receive the frequency of the stored radiobroadcasting station, and comprises a frequency storing means for storing frequencies of radiobroadcasting stations in each of a plurality of areas, a tuning detecting means for detecting the intensity of a signal above a certain level, a selection operating means for selecting the frequency of a necessary radiobroadcasting station of the above-mentioned storing means, and a station selection controlling means which makes it possible to receive the frequency of the radiobroadcasting station in the desired area stored as mentioned above in correspondence to a selection of this selection operating means, the above-mentioned station selection controlling means being so configurated as to skip radiobroadcasting stations below a certain level detected by the tuning detecting means in operation by the selection operating means.

In the present invention, according to the above-mentioned configuration, frequencies of radiobroadcasting stations in an appropriate area stored on a receiving area basis can be selected by the selection operating means, and area selection is performed by the first selection operating means, and memory selection of the desired radiobroadcasting station is performed by the second selection operating means. Also, an area, frequency and/or a name of radiobroadcasting station corresponding to a selection by the selection operating means are displayed obviously on a display unit.

Furthermore, area selection by the first selection operating means is performed only in non-receiving state, and thereby an arbitrary change of the radiobroadcasting station by a wrong operation of the first selection operating means during receiving can be prevented.

Furthermore, sweep is started by an automatic search start signal, the appropriate receiving frequency is stored at each stop of sweep by the tuning detecting means, this stored receiving frequency is compared with the frequencies of radiobroadcasting stations in a plurality of areas which are stored in advance, and thereby the receiving area where frequencies agree is selected, and receiving of the radiobroadcasting station in that area can be made possible, and that the station search is being made can be displayed by the displaying means.

Furthermore, where the level of the received signal of a radiobroadcasting station set in advance in the selected receiving area is below a certain level, the radiobroadcasting station is skipped.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing a first embodiment of a receiver of the present invention, Fig. 2 is a memory configuration view of a first storing means of the same, Fig. 3 is a circuit diagram showing a specific example of a selection operating means of the same, Fig. 4 is a front view showing a configuration of display parts of a display unit of the same, Fig. 5 is a flowchart of the same, Fig. 6 is a block diagram showing a second embodiment, Fig. 7 is a detailed block diagram of a tuning detecting means of the same, Fig. 8 is a circuit diagram showing a specific example of a selection operating means of the same, Fig. 9 is a flow chart of the same, Fig. 10 is a flow chart of a third embodiment, Fig. 11(a) - (c) is a configuration view showing another embodiment of the first storing means, and Fig. 12 is the block diagram showing the conventional example.

THE BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, description is made on a first embodiment of a receiver of the present invention in reference to drawings. Fig. 1 is a block diagram thereof, Fig. 2 is a configuration view of a first storing means, Fig. 3 is a configuration view of a selection operating means, and Fig. 4 is a front view showing display of a display unit.

In the drawings, numeral 1 designates a receiving circuit, and numeral 2 designates a PLL circuit determining the receiving frequency thereof, and the receiving frequency, that is, the radiobroadcasting station is determined by controlling the frequency dividing ratio of a programmable frequency divider of this PLL circuit 2. Numeral 3 designates a station selection controlling means for controlling the above-mentioned PLL circuit 2, numeral 4 designates a memory, numeral 5 designates a selection operating means for selecting the frequency of the receiving radiobroadcasting station, numeral 6 designates a display unit, and in correspondence to an operation of the selection operating means 5, the station selection controlling means 3 outputs a control command of the receiving frequency to the PLL circuit 2 and a required display command to the display unit 6, and performs a command of a write to or a read from the memory 4.

The above-mentioned controlling means 3 comprises a CPU 7, a PLL controlling means 8 for controlling specifically the frequency dividing ratio of the above-mentioned PLL circuit 2 by a command of the CPU 7, a memory inputting/outputting means 9 for writing or reading the receiving frequency to or from the memory 4 by a command of the above-mentioned CPU 7, an operation inputting means 10 for sending a code signal to the CPU 7 in correspondence to an operation of the above-mentioned operation part 5, and a display unit driving means 11 for performing display control of the display unit 6 by a command of the above-mentioned CPU 7.

The above-mentioned memory 4 comprises a first storing means 4a for storing the area and the frequencies of the radiobroadcasting stations in that area for each of a plurality of areas, and a second storing means 4b which can write or read the frequencies of arbitrary radiobroadcasting stations. Then, the above-mentioned first storing means 4a has an area memory group A_1 - A_n and a frequency memory group a_1 - a_n of radiobroadcasting stations on an area basis which are stored in each of the area memory group A_1 - A_n, and the second storing means 4b has a frequency memory group b_1 - b_n which can be written or read arbitrarily. Furthermore, the above-mentioned area memory group A_1 - A_n, as shown in Fig. 2, has a frequency memory group a_1 - a_n in each frequency band of the AM band, FM band and the TV band, and these are determined properly depending on the number of radiobroadcasting stations in each area A_1 - A_n, being stored in advance. This memory is configurated in a read-only type which cannot be re-written, and this configuration prevents a re-write by mistake of a memory of an area of unknown receiving frequency for the frequency of the radiobroadcasting station which differs on an area basis.

Next, the above-mentioned selection operating means 5 comprises a first selection operating 5a for selecting the area memory group A_1 - A_n stored in the above-mentioned first storing means 4a and the second storing means 4b capable of free presetting, and a second selection operating means 5b for selecting the above-mentioned stored frequency group a_1 - a_n or b_1 - b_n, that is, the frequency of the necessary radiobroadcasting station. Here, the second selection operating means 5b has band switches for switching-over the frequency bands of Am band, FM band and TV band, and a memory select switch which selects and reads a desired stored frequency from the frequency memory group a_1 - a_n and b_1 - b_n in each band, and the memory select switch for read is configurated with a scroll system by one key or a plurality of specific keys. Also, it has a station select switch consisting of an up/down switch which can arbitrarily select the receiving frequency when the second storing means 4b is selected by the above-mentioned first selection operating means 5a, and a memory switch for writing the frequency of an arbitrary desired radiobroadcasting station to the second storing means 4b. Furthermore, it has a power switch for making ON/OFF of the power source and other necessary operation switches.

Fig. 3 shows an example wherein the selection operating means 5 is configurated with matrix key switches. This means that it has keys K_1 - K_9 and terminals T_1 - T_7 for giving a signal input to the above-mentioned operation inputting means 10 in correspondence to a push thereof, and the operation inputting means 10 generates a code signal corresponding to a short-circuit of the terminals T_1 - T_7 by a push of the key K_1 - K393. Here, K_1 designates a power switch key, K_2 and K_3 designate station select UP/DOWN keys, K_4 designates a band switch key, K_5 designates an area select switch key, and K_7 designates a memory switch key for write. Then, the key K_6 is equivalent to the above-described first selection operating means 5a, and the band switch key K_4 and the memory select switch key K_5 are equivalent to the second selection operating means 5b, and after

selecting an area by the key K_6, switching to a desired band by the key K_4 and selection of a desired radiobroadcasting station are performed. In addition, by the keys K_8 and K_9 and the operating means using the keys K_9 and K_7, and by a clock means provided in the station selection controlling means 3, a timer and an alarming function as described later are provided.

Next, description is made on the above-mentioned display unit 6 in reference to Fig. 4. The display unit has an area display part 12 showing the receiving area, a band and/or AM/PM display part 13, a frequency or time display part 14, a memory channel display part 15, and a display part 16 of other functions. The above-mentioned area display part 12 displays TOKYO 12a, NAGOYA 12b, OSAKA 12c, JR NEW SUPEREXPRESS (Shinkansen) LINE 12d and FREE 12e, and TOKYO 12a - JR NEW SUPEREXPRESS LINE 12d are equivalent to the displays of the area memory group A_1 -A_n in the above-described first storing means 4a, and FREE 12e is equivalent to the display of the second storing means 4b. The above-mentioned display part 13 has receiving band display parts of AM band 13a, FM band 13b and TV band 13c as a band display in receiving, and display parts of forenoon AM 13a as clock display (used also for the AM band in receiving) and afternoon PM 13d. The above-mentioned display part 14 has segments for numeric display, a colon 14a for time display and a dot 14b for displaying decimal point in frequency display, and displays the time in non-receiving state, displays the frequency (KHz or MHz) in An or FM receiving and displays the channel (1 - 12ch) in TV receiving, respectively. Also, the above-mentioned display part 15 displays the memory channel of the frequencies (the above-mentioned a_1 - a_n or b_1 - b_n) which are stored in each of the memory groups A_1 - A_n and 4b in selection on the above-mentioned area display part 12a - 12d and free display part 12e, and has a display M 15a showing the memory receiving state and a memory channel display part 15b. The above-mentioned display part 16 for other functions has a display 16a showing setting of alarm time, a display 16b showing an alarm of expiration of a predetermined time, and a display 16c showing an alarm of reduction in voltage, that is, replacement of buttery.

Here, description is made on the relation to the clock function in reference to Fig. 3 and Fig. 4. When the power switch key K_1 is turned off, the display part 13 shows forenoon and afternoon of the time by the display parts 13a and 13b, and the display part 14 displays a time 12:00 - 11:59. Then, the current time can be adjusted by pushing the up/down keys K_2 and K_3 while pushing the time set key K_7 used also for the above-mentioned memory. Furthermore, an alarm of expiration of a predetermined time is set by pushing the alarm key K_8, and the setting thereof is displayed by lighting the above-mentioned display 16b, and an appropriate predetermined time (1 - 180 minutes) can be set by pushing the up/down keys K_2 and K_3 while pushing the key K_8. Also, the alarm time can be adjusted by changing the current time on the display part 14 to the alarm time by pushing the stand-by key K_9, and pushing the up/down keys K_2 and K_3 while pushing the key K_9, and by releasing the push of the key K_9, the display 16a is lit to show the setting.

Next, description is made on the station selecting operation based on a flowchart in Fig. 5. First, in Step S_1, whether power is put in ON state or OFF state by the key K_1 is judged, and when power is in OFF sate, processing proceeds to Step S_2, and On or OFF of the area select key K_6 is judged, and when it is OFF, processing returns to the former step, and by turning on the key K_6, processing proceeds to the next step S_3. In this step S_{3a}, judgment is made on whether or not the area memory A_1 is first selected among the area memory group A_1 - A_n when the key K_6 is turned on (note that $n=4$ in the embodiment as shown in Fig. 4), and when A_1 is selected, the next area memory A_2 is selected in Step S_{4a}, and the area display part 12b is lit in Step S_{5a}. On the other hand, when A_1 is not selected in this step S_{3a}, processing proceeds to the next step S_{3b} (not illustrated), and proceeds up to Step S_{3n} in sequence by similar judgments, and where judgment results in YES in Steps S_{3b} - S_{3n} like the above-mentioned case, the memory groups A_3 - A_n and 4b are selected in Steps S_{4b} - S_{4n}, and the area display parts 12c - 12e are lit in Steps S_{5b} - S_{5n}. Then, where judgment results in NO in Step S_{3n}, the area memory A_1 is selected in Step S_6. and the area display part 12a is lit in Step S_7. This means that in the power-off state, the memory groups A_1 - A_n and 4b can be changed-over every time of push of the area select key K_6 (in other words, the first selection operating means 5a), and the area display parts 12a - 12e can be displayed in a sequential change-over fashion, and any of them is lit all the time.

Then, in the above-mentioned Step S_1, when power is put in ON state by pushing the key K_1, receiving is made possible, and processing proceeds to Step S_{8a}. In this Step S_{8a}, judgment is made on whether or not A_1 is selected from among the area memory group A_1 - A_n, and when A_1 is selected, processing proceeds to the next Step S_{9a}, and the state of receiving the area memory A_1 is brought. In this Step S_{9a}, selection of receiving frequency of the desired radiobroadcasting station in the appropriate area is performed by band

switch-over by an operation of the key K_4 and selection from the frequency memories a_1 - a_n by an operation of the key K_5, and the band displays 13a - 13c, the frequency display 14, and the memory channel display 15b are performed, and thereby receiving of that radiobroadcasting is made possible. On the other hand, when judgment results in NO in Step S_{8a},processing proceeds sequentially to Steps S_{8b} - S_{8n}, and judgment is made on whether or not the selected areas are the area memory A_2 - A_n respectively, and when the selected areas are A_2 - A_n, processing proceeds to Steps S_{9b} - S_{9n}, and in these Steps S_{9b} - S_{9n}, actions similar to that in Step S_{9a}, that is, selective receiving and display are performed in the respective are a memories A_2 - A_n. Furthermore, when judgment results in NO in Step S_{8n}, processing proceeds to Step S_{10}, the receiving state of the storing means 4b is brought (that is, FREE state), and selection of the frequency memories b_1 - b_n is performed like the above-mentioned case, and in this Step S_{10}, up/down selection of the receiving frequency by the keys K_2 and K_3 is possible, and a desired frequency can be written (re-written) arbitrarily to the memories b_1 - b_n by an operation of the key K_7.

Next, description is made on a second embodiment based on Fig. 6 - Fig. 9. In Fig. 6 - Fig. 9, the same numerals and symbols as those in the above-mentioned first embodiment designate the same parts.

In Fig. 6, numeral 17 designates a tuning detecting means, which detects whether or not the receiving circuit 1 has tuned above a certain level. Numeral 18 designates a tuning inputting means in the station selection controlling means 3, which makes the CPU 7 operate based on an output of the above-mentioned tuning detecting means 17. Numeral 4c designates a third storing means provided in the memory 4, and this third storing means is configurated in a manner capable of read and write like the above-mentioned second storing means 4b, and stored the frequencies of the radiobroadcasting stations tuned by sweep in automatic search for identifying the area of use as described later. Also, numeral 5c designates an automatic search start operating means, which is operated in performing s write to the above-mentioned third storing means 4c, and is a key K_{10} as shown in Fig. 8 when shown by a configuration with matrix key switches, and the keys K_1 - K_9 are similar to the above-described ones.

The above-mentioned tuning detecting means 17 takes out an intermediate frequency signal of the receiving circuit 1 and applied it to an input terminal A, and comprises a signal intensity detecting circuit 17a which detects whether or not the intensity of a signal received by amplitude detection of the intermediate frequency signal is above a certain level, and a frequency detecting circuit 17b which detects that the value of frequency is a predetermined value when the d.c. component (S curve voltage) of the detected signal of the intermediate frequency signal is within a predetermined voltage range, and the both circuits supply detection outputs respectively from terminals B and C to the above-mentioned tuning inputting means 18.

Next, description is made on selection of the receiving area by automatic search in this second embodiment along with a flow chart in Fig. 9. First, to identify the area where the receiver is used, automatic search is started by operating the automatic search start operating means 5c (key K_{10}). Then, in Step S_{11}, a starting band is set (here, set to the FM band capable of high-speed search), and NOW IN AREA SEARCH is lit on the display unit 6 (properly added to the above-described display unit in Fig. 4) (Step S_{12}). In the next Step S_{13}, receiving sweep is started with a minimum value f_{min} ofthe FM band at predetermined frequency intervals. In Step S_{14}, judgment is made on whether or not the frequencies has been swept up (that is, the sweep has been done from $f_{min}$to f_{max}) ever time of setting the frequency, and when the judgment results in NO, in the next Step S_{15}, one level is generated when a detection of the above-mentioned signal intensity detecting circuit 17a is above a certain level, and processing proceeds to the next Step S_{16}, and here, when the frequency in the above-mentioned frequency detecting circuit 17b is a predetermined value (for example, 10.7 MHz in the case of FM), processing proceeds to the next Step S_{17}. Where the judgments in these Steps S_{15} and S_{16} result in YES, the sweep of receiving is stopped once, and in Step S_{17}, the appropriate receiving frequency is written to the third storing means 4c. Then, in the next Step S_{18}, judgment is made on whether or not writes of a plurality of frequencies to be set in the third storing means have been made to the third storing means 4c, and where the writes have been performed, processing proceeds to the next Step S_{19}. On the other hand, when the judgments result in NO in Step S_{15} and S_{16} including this Step S_{18}, processing returns to Step S_{13}, and similar operations are performed repeatedly for the next frequency. Then, when the judgment of write of the set number results in No in Step S_{18} despite that the frequencies have been swept up (that is f_{min} - f_{max}), processing proceeds to the YES side in Step S_{14}, that is, to Step S_{20}, and the display of NOW IN AREA SEARCH is put out, and a display of SEARCH IMPOSSIBLE is lit in Step S_{21}.

In Step S_{19}, the area memory group A_1 - A_n in the first storing means 4a are selected, and, for example, the frequencies of the frequency memory

group a_1 - a_n in the selected area memory A_1 are compared with the receiving frequencies C_1 - C_n written to the third storing means 4c in Step S_{17}, in Step S_{23} through the next Step S_{22}, and when the both agree with each other, processing proceeds to Step S_{24}, and the receiving area is determined. On the other hand, where the both do not agree with each other in Step S_{23}, processing returns to Step S_{19}, selects the next area memory A_2, and takes a comparison again in Step S_{23} through Step S_{22}. Then, a loop of these Steps S_{19}, S_{22} and S_{23} are performed in sequence, and all area memories A_1 - A_n of the first storing means 4a are selected, and where the frequency memory group a_1 - a_n are compared with the frequencies c_1 - c_n of the third storing means 4c and don't agree therewith, processing proceeds from the YES side of Step S_{24}, the band and the frequency in that area are set in Step S_{25} (these band and frequency may be set properly, but may be set by one last memory as described later). Next, in Step S_{26}, the display of NOW IN AREA SEARCH is put out, and in Step S_{27}, displays of band, receiving frequency and area are lit. Here, the automatic area search is completed, and the area where the receiver is used at that time is automatically searched, and the selection is completed.

In addition, the reason of requiring writes of a plurality of set frequencies to the third storing means 4c in the above-mentioned Step S_{18} is to correctly select the appropriate radiobroadcasting station where radiobroadcasting stations of the same frequency exist in different areas, and whether the store of two stations is enough or the store of three or more stations is required has only to be properly set in reference to schedules of opening radiobroadcasting stations in the future.

Next, description is made on a third embodiment. In a block diagram as shown in Fig. 6, this embodiment has a configuration of a flowchart as shown in Fig. 10, and to be brief, in selecting the radiobroadcasting station after selecting the receiving area by utilizing the tuning detecting means 17, radiobroadcasting stations tuned below a certain level are automatically skipped.

Hereinafter, description is made on based on the flow chart as shown in Fig. 10. First, in Step S_{31}, selection of the receiving area memory is performed. This selection is made by operating the area select switch key K_6, or by operating the automatic search key K_{10}. Next, in Step S_{32}, whether or not the memory select switch key K_5 has been operated is judged, and when the key has been operated, processing proceeds to the next Step S_{33}, and when the key has been operated, the same judgment is repeated. In Step S_{33}, the frequency memory group a_1 - a_n in the appropriate area is selected, and in the next Step S_{34}, the frequency of the selected memory group a_1 - a_n is set, and the level of the received signal at that time is judged based on the output of the signal intensity detecting circuit 17a, and when the level is low, processing returns to Step S_{33}, and judges again on the next frequency, and when the level exceeds, processing proceeds to the next Step S_{36} and the receiving state is brought. This means that radiobroadcasting stations of low receiving level are skipped by judgment is Step S_{35}.

Next, description is made on other embodiments based on Fig. 11 (a) - (c).

First, in an example of Fig. 11 (a), along with receiving frequencies AM_1 - AM_n, FM_1 - FM_n and TV_1 - TV_n, the name N of each radiobroadcasting stations is also stored in advance in the memories a_1 - a_n in each area memory group A_1 - A_n, and this name is also displayed on the above-mentioned display unit 6. As a display example thereof, it may be displayed on a separate display part along with the frequency display 14, or may be displayed in place of the frequency display 14.

Next, in an example of Fig. 11 (b), area-based last storing means LM_1 - LM_n storing the last receiving frequency of each area before change-over in selecting the appropriate are are provided in each area memory group A_1 - A_n, respectively. In the case where these storing means LM_1 - LM_n are not provided, setting is made in a manner that the receiving frequency first set is, for example, the first memory a_1 of the AM band when each of the area memory group A_1 - A_n is changed-over, but by providing the area-based last storing means LM_1 - LM_n as mentioned above, the frequency of the last radiobroadcasting station to be listened to most often is each area is stored, and it can be selected most preferentially in changing-over the area. In an example of Fig. 11 (c), in addition to the example of Fig. 11 (b), last storing means AM_0, RM_0 and TV_0 are further provided on a band basis to store the frequency of the lastly listened radiobroadcasting station in the appropriate band even if the band is changed-over on a area basis.

In addition, the above description is made on the example wherein the memory group a_1 - a_n of the frequencies stored in each of the area memory group A_1 -A_n of the first storing means 4a can not be re-written, but the memory group a_1 - a_n in these A_1 - A_n can also be configurated so as to be arbitrarily re-written like the memory group b_1 - b_n of the second storing means 4b. In this case, needless to say, configuration is made so that selection of the frequency by the keys K_2 and K_3 is possible even in selecting the areas A_1 - A_n.

Also, in the above-mentioned embodiment, selection of the area memory group by the first selection operating means (that is, 5a or the key K_6) is made possible only in the non-receiving

state, but selection of the area memory can also be made possible in the receiving state (that is, power-on state). For this purpose, Steps S_2 - S_7 have only to be inserted after Steps S_{9a} - S_{9n} and S_{10} in the flow chart of Fig. 5.

APPLICABILITY IN INDUSTRIES

The present invention is configurated as described above, and by storing radiobroadcasting stations in a plurality of areas in advance, the radiobroadcasting station can be selected easily and reliably by a simple operation without selecting the station while taking the trouble of scrolling frequencies even if the receiving frequency is unknown in the case of visiting the appropriate area on a private or business trip or the like, and memory and selection of even more radiobroadcasting stations can be performed by the storing means capable of arbitrarily storing.

Furthermore, the first selection operating means for selecting the area and the second selection operating means for selecting the frequency of the stored radiobroadcasting station are provided, and displays thereof are performed, and thereby a receiver can be obtained which is more reliable and easy to find the current receiving state, and is more convenient by displaying the name of radiobroadcasting station.

Furthermore, selection of the area by the first selection operating means is made possible only in the non-receiving state, and thereby even if the first selection operating key is operated by mistake in the state of station selection receiving, a generation of such problem can be prevented that the receiving changes to that of another station, causing a confusion.

Furthermore, receiving sweep is started by an automatic search start signal, and the appropriate receiving frequency is stored every time the sweep is stopped by a detection of the tuning detecting means, and the memory of this receiving frequency is compared with the frequencies of the radiobroadcasting stations in a plurality of areas which are stored in advance, and thereby the receiving area where the frequencies agree is selected, and the receiving of the radiobroadcasting station in that area is made possible, and thus the frequency capable of receiving in an unknown area can be simply selected only by performing an operation of automatic search start. In addition, the area searching is clear at a glance by display, and this is very convenient.

Furthermore, in the case where the level of the signal received from the radiobroadcasting station stored in advance is lower than a certain level, by skipping that radiobroadcasting station, the use in an area of unknown receiving frequency becomes very convenient.

Claims

1. A receiver capable of selectively receiving the frequency of a stored radiobroadcasting station, characterized by comprising a first storing means for storing the frequencies of radiobroadcasting stations in each of a plurality of areas, a second storing means capable of storing the frequencies of arbitrary radiobroadcasting stations, a selection operating means for selecting the frequency of a necessary radiobroadcasting station from said first storing means and second storing means, and a station selection controlling means which makes it possible to receive the frequency of the radiobroadcasting station in said desired stored area which is stored in correspondence to a selection of this selection operating means.

2. A receiver in accordance with claim 1, characterized by that the selection operating means comprises a first selection operating means for selecting an area, and a second selection operating means for selecting the frequency of a necessary radiobroadcasting station in the selected area in the state that the selection has been made by said first selection operating means.

3. A receiver in accordance with claim 2, characterized by being configurated in a manner that a display unit having an area name display part for a plurality of areas and a receiving frequency display part is provided, and when the first selecting means is operated, the name of the area is selectively displayed on the area name display part in correspondence to that selecting operation, and when the second selecting means is operated, the frequency of the selected radiobroadcasting station is selectively displayed on the receiving frequency display part.

4. A receiver in accordance with claim 2, characterized by being configurated in manner that a display unit having an area name display part for a plurality of areas and a receiving radiobroadcasting station name display part is provided, and when the first selection operating means is operated, the area name is selectively displayed on the area name display part in correspondence to that selecting operation, and the name of the radiobroadcasting station selected by an operation of the selectively displayed on the radiobroadcasting station name display part.

5. A receiver in accordance with claim 2, 3 or 4, characterized by that the station selection controlling means is configurated so that selection of an area by the first selection operating means is made possible only in the non-receiving state.

6. A receiver in accordance with claim 2, characterized by that the station selection controlling means is configurated so as to control in a manner that where an area n the first storing means is selected by the first selection operating means, selection of the receiving frequency by the station select switch is stopped, and where the second storing means is selected, an arbitrary selection of the receiving frequency by the station select switch is possible, and that desired arbitrary receiving frequency can be written to the storing means.

7. A receiver capable of selectively receiving the receiving frequency of a radiobroadcasting station stored in advance by a predetermined operation, characterized by comprising a first storing means storing the frequencies of radiobroadcasting stations in each of a plurality of areas, a tuning detecting means detecting tuning above a certain level, an automatic search start operating means for identifying an area of use, a second storing means storing the receiving frequency every time when sweep is started by a start signal of this automatic search start operating means and the sweep is stopped by an output of said tuning detecting means, and a station selection controlling means which compares the receiving frequency of this second storing means with the frequencies stored in said first storing means, thereby selects the receiving area where the frequencies agree with each other, and makes radiobroadcasting station in that area.

8. A receiver in accordance with claim 7, characterized by installing a selection operating means for selecting the frequency of the necessary radiobroadcasting station in the selected receiving area.

9. A receiver in accordance with claim 7, characterized by comprising a third storing means capable of storing the frequencies of arbitrary radiobroadcasting stations and a selection operating means for selecting the frequencies of this third storing means.

10. A receiver in accordance with claim 7, characterized by that the tuning detecting means comprises an intensity detecting circuit detecting that the intensity of a signal received by amplitude detection of an intermediate frequency signal is above a certain level, and a frequency detecting circuit detecting whether or not the value of the frequency of said intermediate frequency signal is a predetermined value, thereby to perform detection of the level of the received signal and detection of agreement of the frequencies.

11. A receiver in accordance with claim 7, characterized by comprising a displaying means for displaying automatic search for the receiving area after stating sweep for the receiving area after stating sweep by the automatic search start operating means or displaying the case where the search has become impossible.

12. A receiver capable of selectively receiving the frequency of a stored radiobroadcasting station, characterized by comprising a frequency storing means for storing the frequencies of radiobroadcasting stations in each of a plurality of areas, a tuning detecting means for detecting the signal intensity above a certain level, and a selection operating means for selecting the frequency of the necessary radiobroadcasting station of said storing means and a station selection controlling means which makes it possible to receive the frequency of a radiobroadcasting station in said stored desired area in correspondence to a selection of this selection operating means, said station selection controlling means being configurated as to skip radiobroadcasting stations below a certain level detected by the tuning detecting means in operation by the selection operating means.

FIG. 1

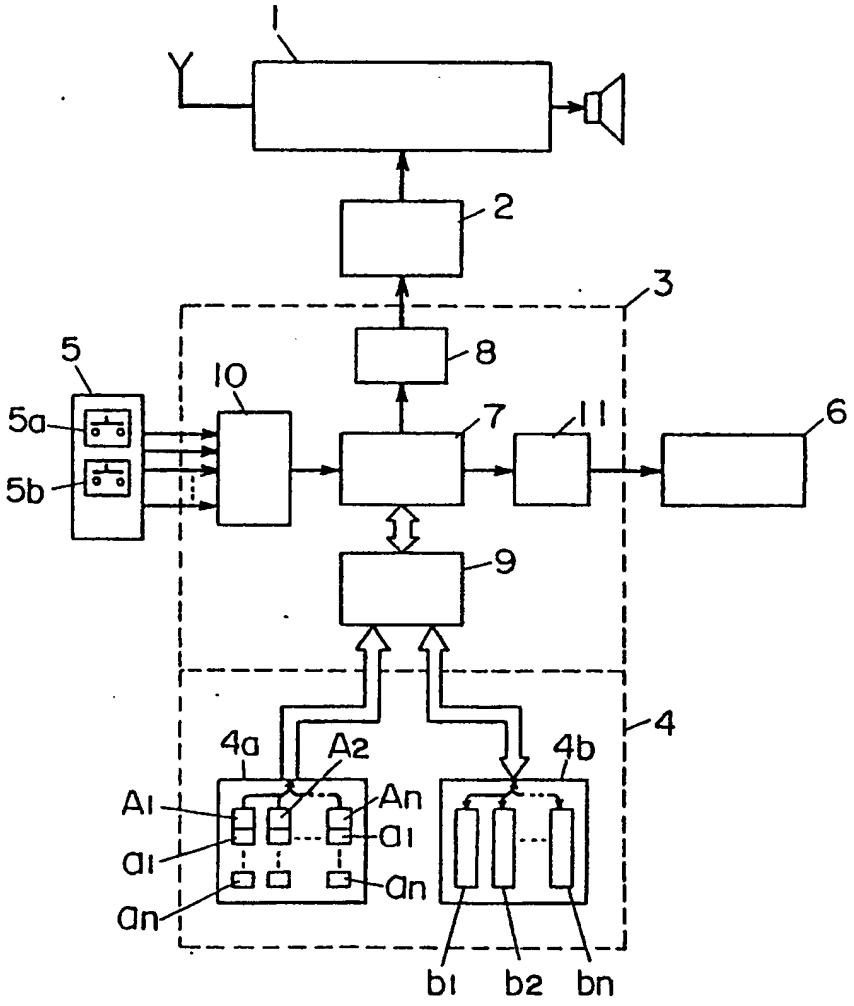


FIG. 2

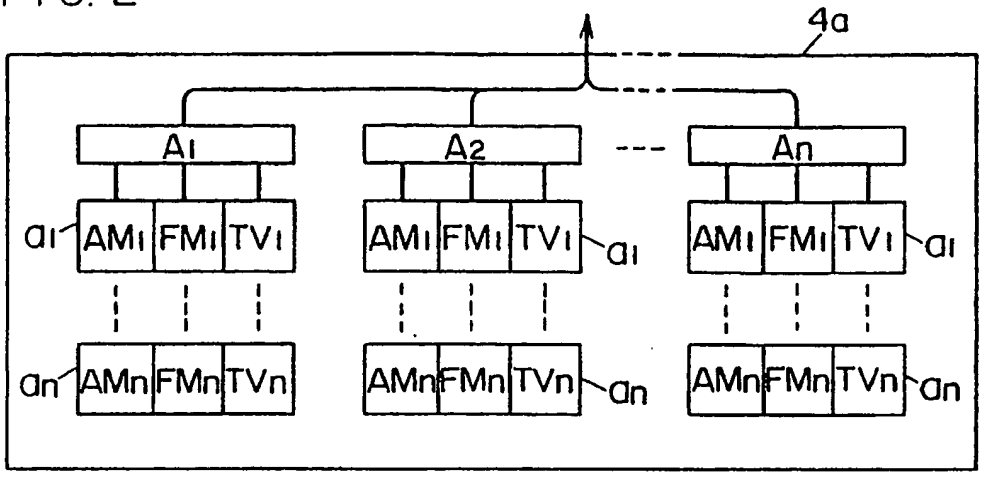


FIG. 3

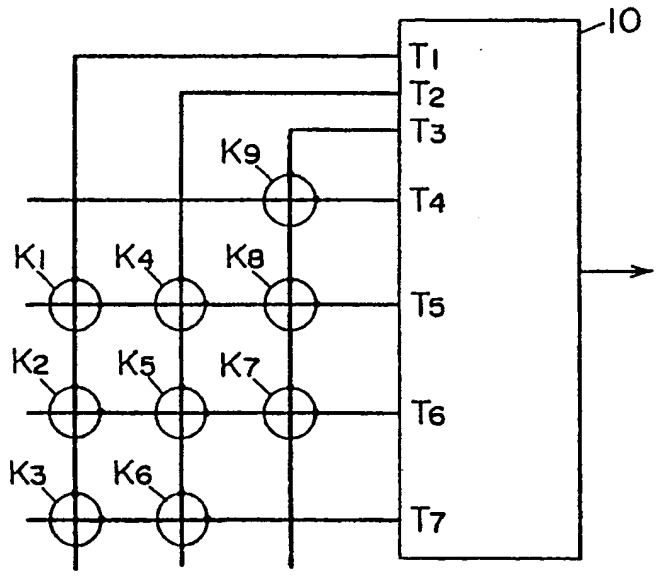


FIG. 4

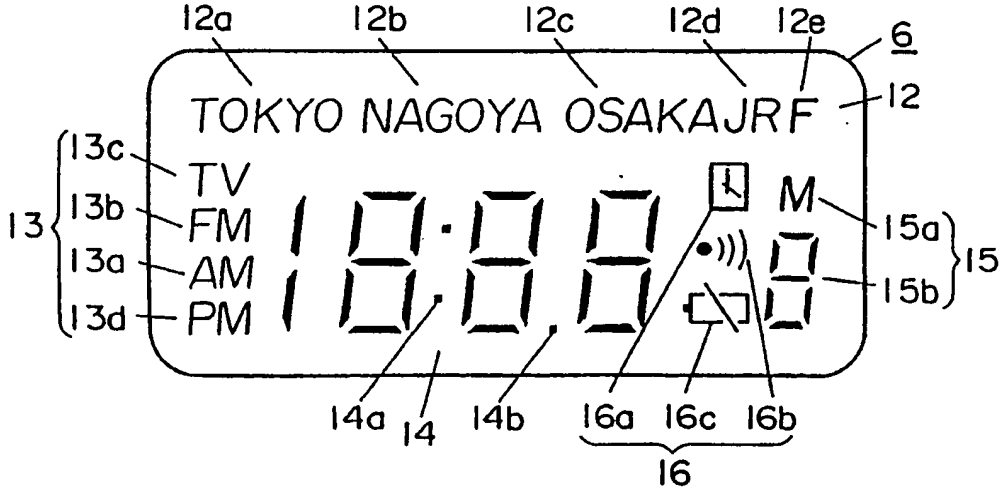


FIG. 5

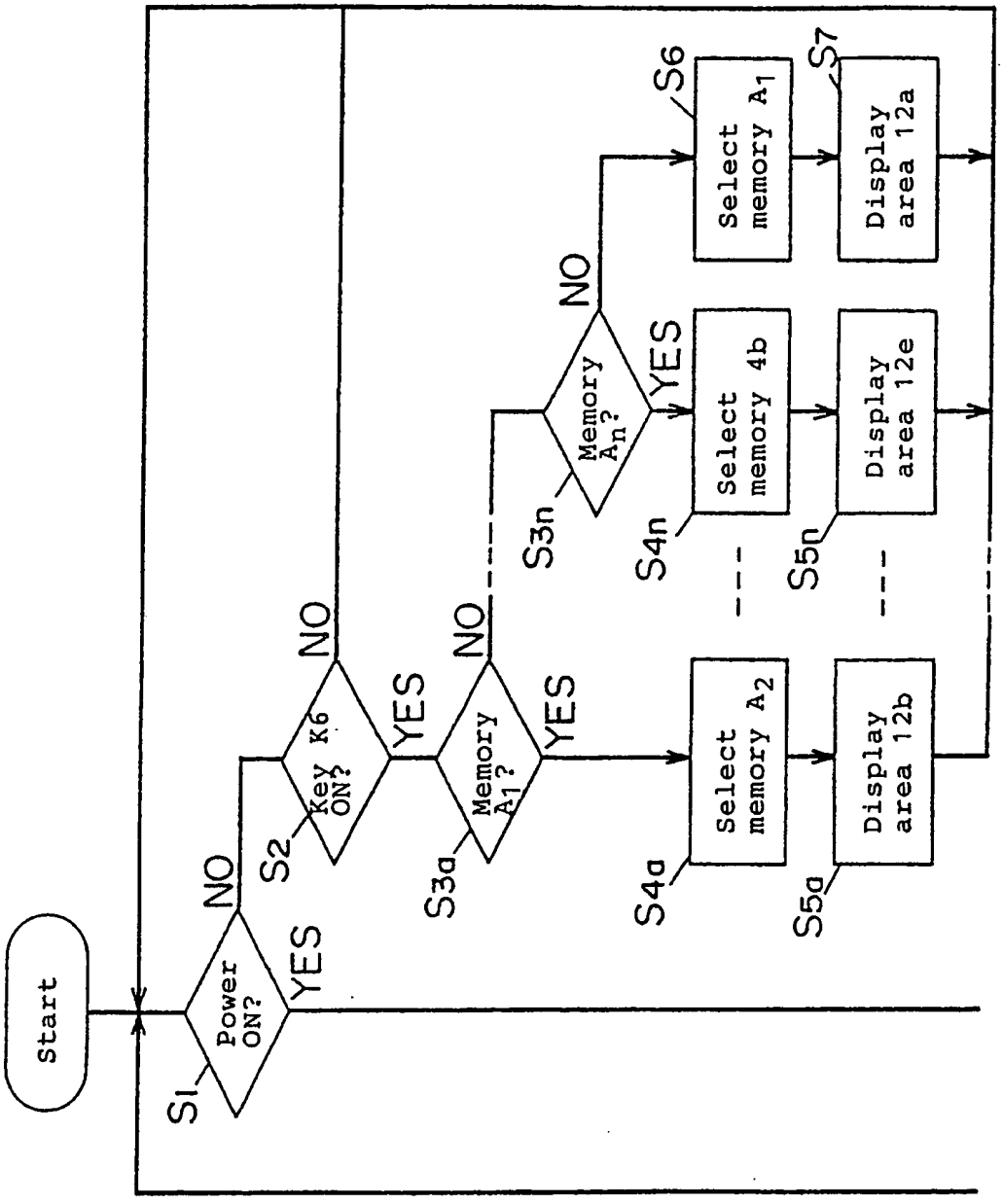

Start
Power ON?
S1
NO
YES
Key K6 ON?
S2
NO
YES
Memory A1?
S3a
NO
YES
Memory An?
S3n
NO
YES
Select memory A2
S4a
Display area 12b
S5a
Select memory 4b
S4n
Display area 12e
S5n
Select memory A1
S6
Display area 12a
S7

FIG. 5

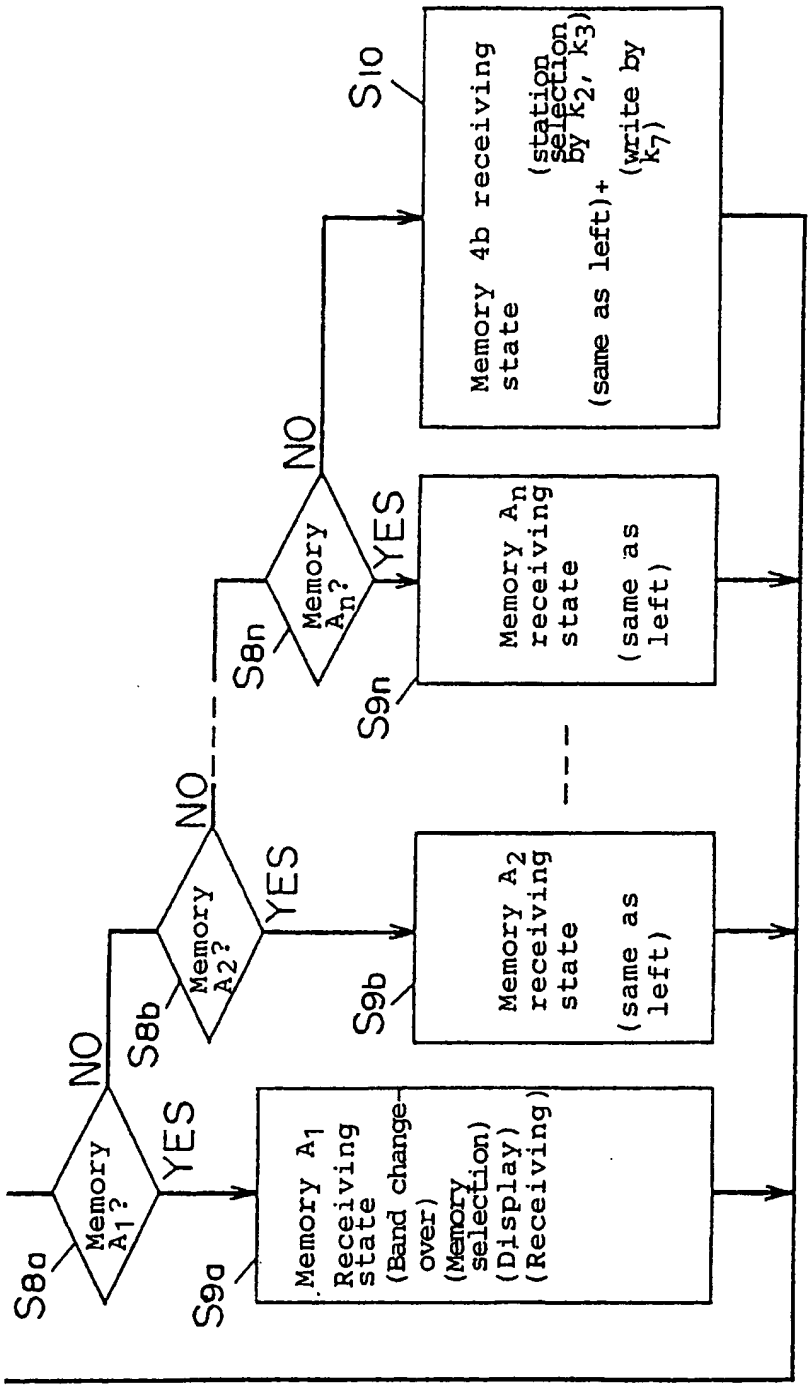

S8a
Memory A1?
NO
YES
S9a
Memory A1 Receiving state (Band change-over) (Memory selection) (Display) (Receiving)
S8b
Memory A2?
NO
YES
S9b
Memory A2 receiving state (same as left)
S8n
Memory An?
NO
YES
S9n
Memory An receiving state (same as left)
S10
Memory 4b receiving state (same as left)+ (station selection by k2, k3) (write by k7)

FIG. 6

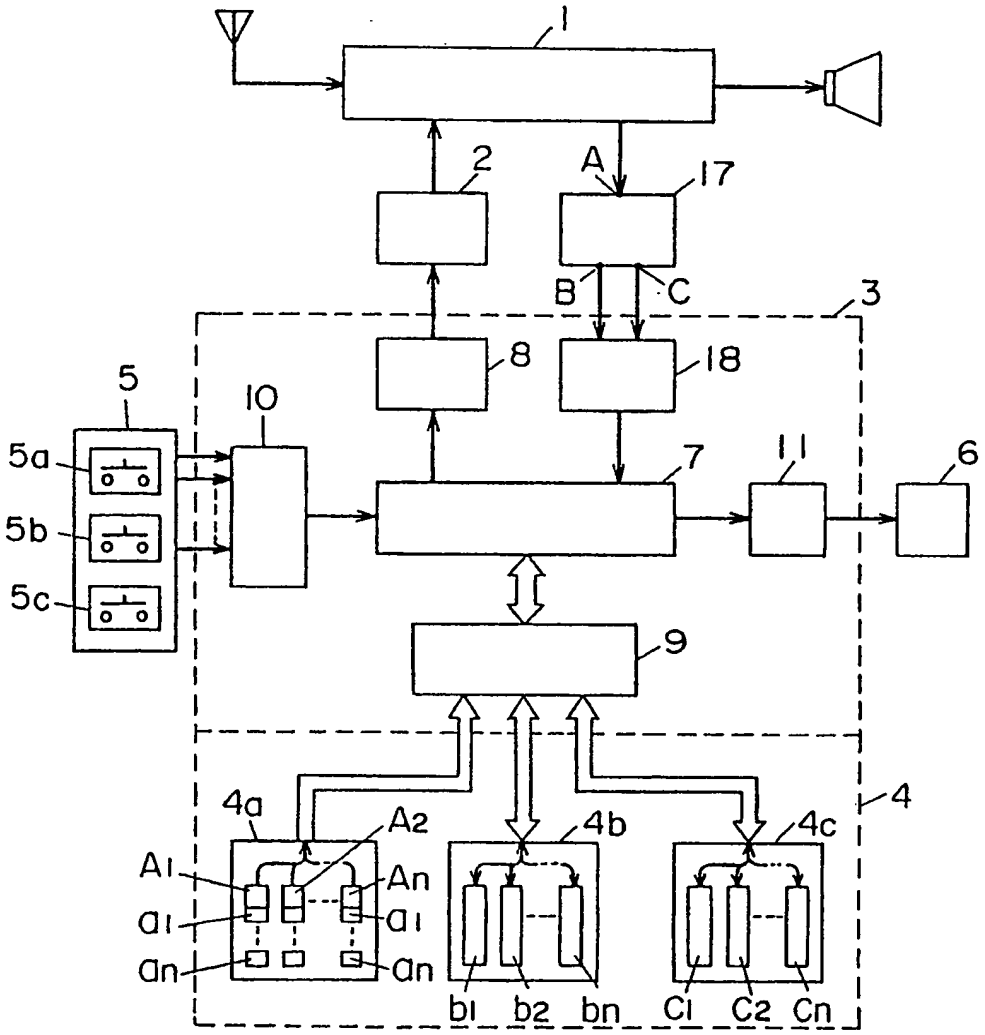

1
2
A
17
B
C
3
8
18
5
10
5a
5b
5c
7
11
6
9
4
4a
4b
4c
A1
A2
An
a1
an
b1
b2
bn
C1
C2
Cn

FIG. 7

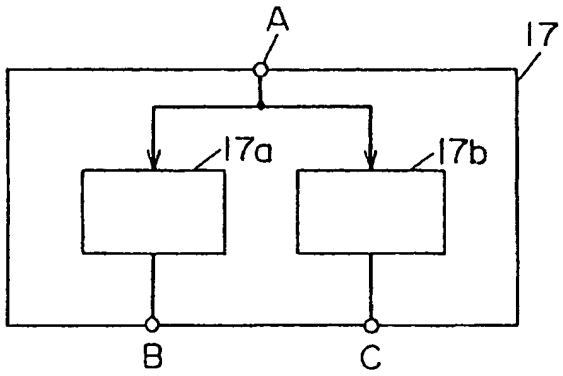


FIG. 8

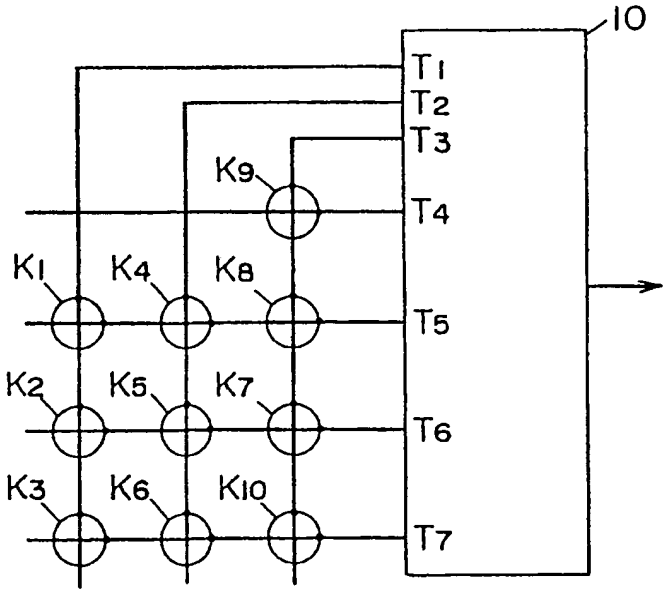


FIG. 9

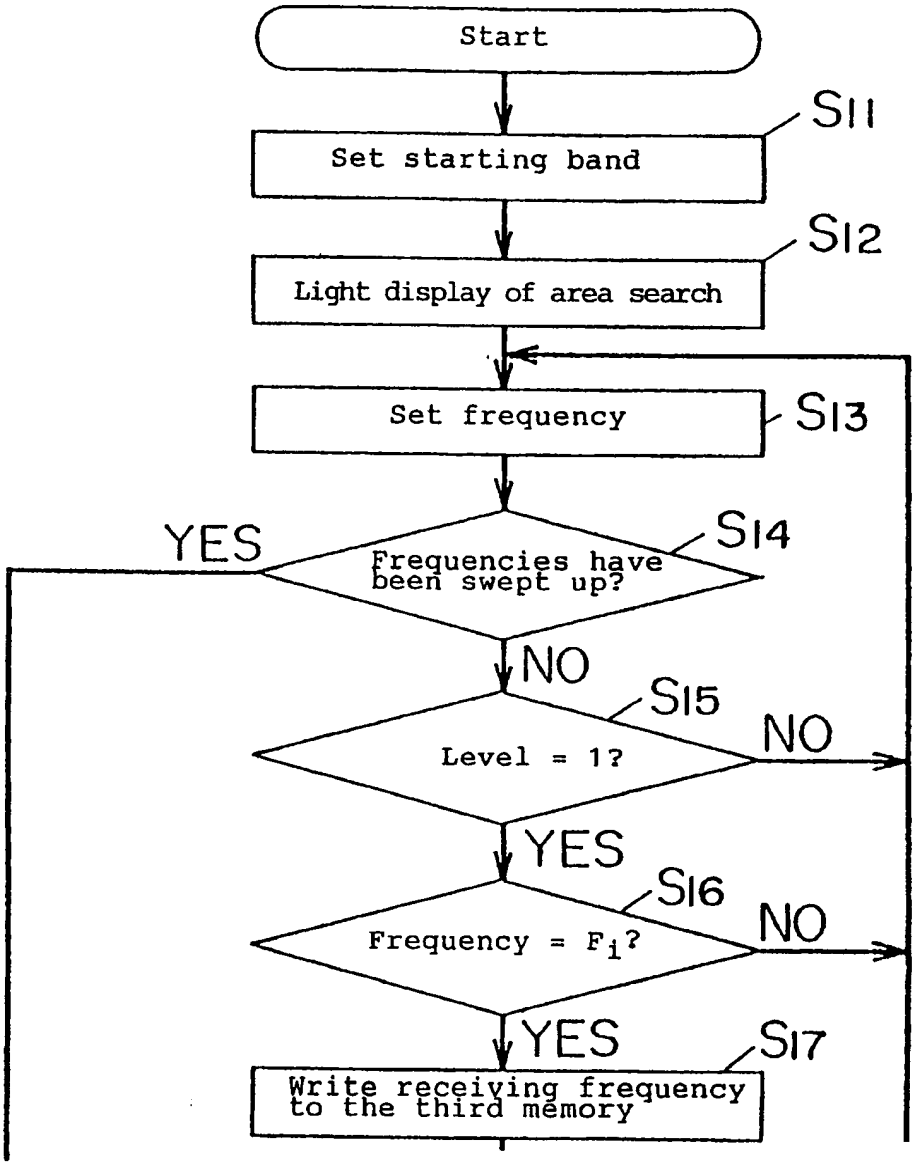

Start
S11
Set starting band
S12
Light display of area search
Set frequency
S13
YES
S14
Frequencies have been swept up?
NO
S15
Level = 1?
NO
YES
S16
Frequency = F_i?
NO
YES
S17
Write receiving frequency to the third memory

FIG. 9

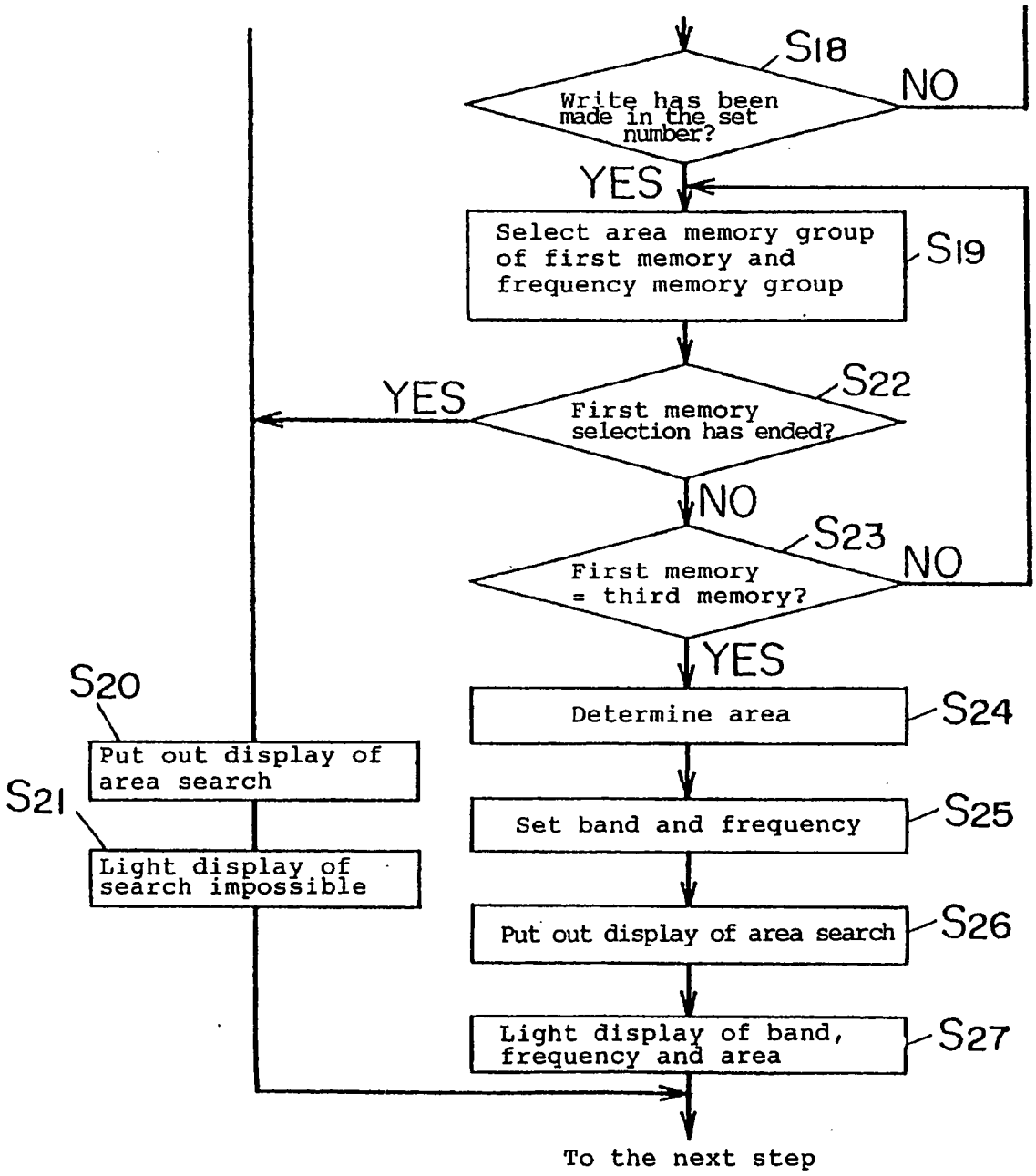

S18
Write has been made in the set number?
NO
YES
Select area memory group of first memory and frequency memory group
S19
S22
First memory selection has ended?
YES
NO
S23
First memory = third memory?
NO
YES
S20
Put out display of area search
S21
Light display of search impossible
Determine area
S24
Set band and frequency
S25
Put out display of area search
S26
Light display of band, frequency and area
S27
To the next step

FIG. 10

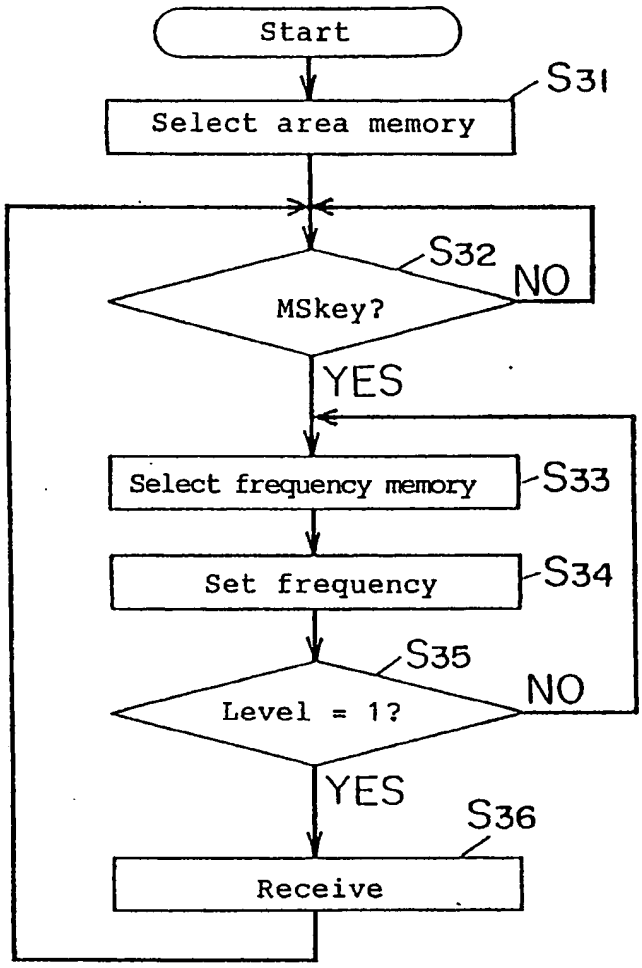

Start
S31
Select area memory
S32
MSkey?
NO
YES
Select frequency memory
S33
Set frequency
S34
S35
Level = 1?
NO
YES
S36
Receive

FIG. 11

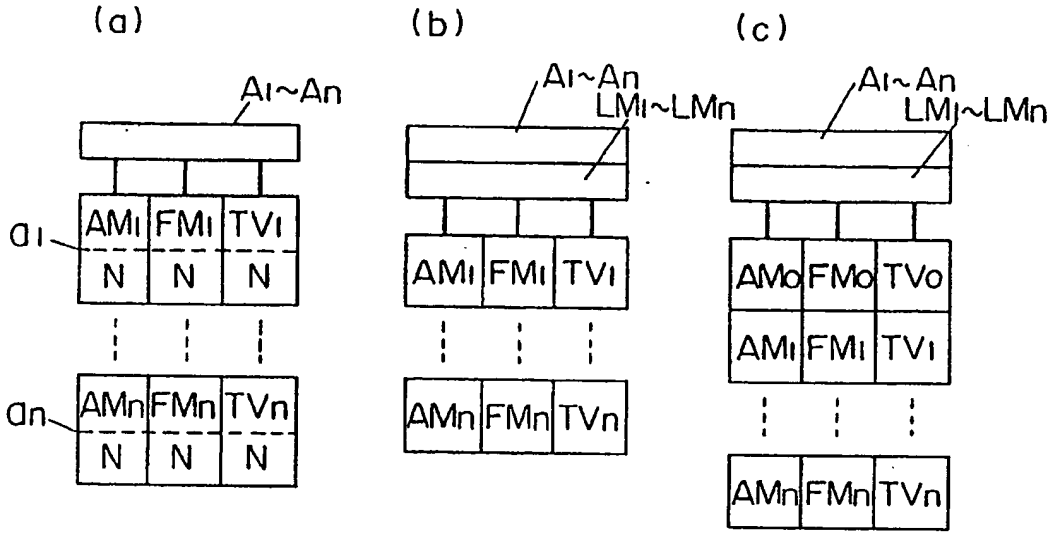
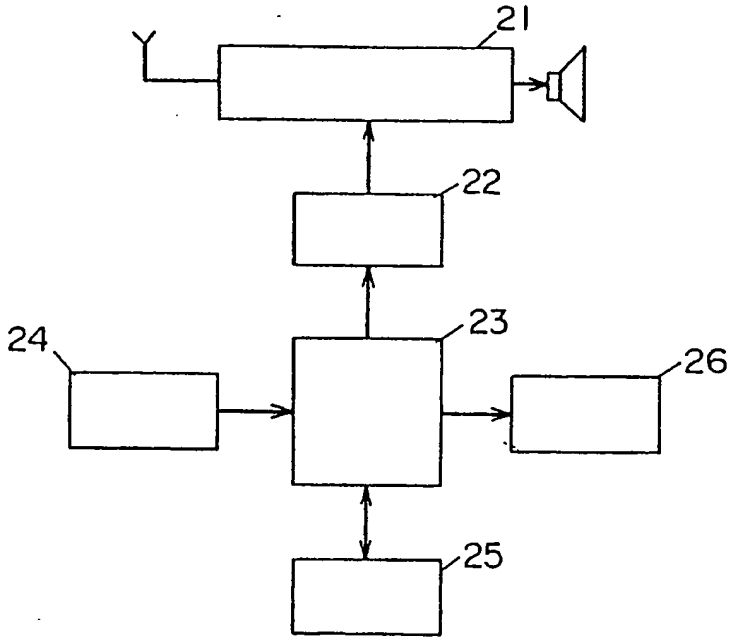

(a)
(b)
(c)
A1~An
LM1~LMn
a1
an
AM1
FM1
TV1
N
AMn
FMn
TVn
AMo
FMo
TVo

FIG. 12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INTERNATIONAL SEARCH REPORT

International Application No PCT/JP90/01517

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[5] H04B1/06, H04B1/16

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	H04B1/06, H04B1/16

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

Jitsuyo Shinan Koho 1965 - 1990
Kokai Jitsuyo Shinan Koho 1971 - 1990

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	JP, A, 58-188938 (Blaupunkt-Werke GmbH), November 4, 1983 (04. 11. 83), EP, A1, 92055, US, A, 4476582, EP, B1, 92055, DE, C2, 3214155	1-12
Y	JP, A, 57-69925 (Mitsubishi Electric Corp.), April 30, 1982 (30. 04. 82), SE, A, 8104484, DE, A1, 3129349, US, A, 4430753	1-12
Y	JP, A, 57-69924 (Mitsubishi Electric Corp.), April 30, 1982 (30. 04. 82), (Family: none)	7-12
Y	JP, A, 61-123321 (Sanyo Electric Co. Ltd.), June 11, 1986 (11. 06. 86), (Family: none)	1
Y	JP, A, 58-62922 (Nissan Motor Co., Ltd.), April 14, 1983 (14. 04. 83), (Family: none)	1

* Special categories of cited documents: [10]

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
February 19, 1991 (19. 02. 91)	March 4, 1991 (04. 03. 91)
International Searching Authority	**Signature of Authorized Officer**
Japanese Patent Office	